

NEW COMBINATIONS IN *MICRANTHES* (A SEGREGATE OF *SAXIFRAGA*, SAXIFRAGACEAE) IN NORTH AMERICA

Luc Brouillet

*Institut de recherche en biologie végétale
Université de Montréal
4101 Sherbrooke Street E
Montréal, Québec, CANADA H1X 2B2*

Richard Gornall

*Department of Biology
University of Leicester
University Road
Leicester, LE1 7RH, U.K.*

ABSTRACT

Molecular phylogenetic analyses have recently shown that *Saxifraga* s. l. must be divided into *Saxifraga* s. str. and *Micranthes*. Within the framework of preparing the *Micranthes* treatment for the Flora of North America, we are proposing new combinations for the species of North American *Saxifraga* that belong to *Micranthes* and have yet to be transferred to the latter.

RESUMEN

Los análisis filogenéticos moleculares han mostrado recientemente que *Saxifraga* s. l. debe dividirse en *Saxifraga* s. str. y *Micranthes*. En el marco de preparación del tratamiento de *Micranthes* para la Flora of North America, proponemos nuevas combinaciones para las especies de *Saxifraga* norteamericanas que pertenecen a *Micranthes* y aún tienen que transferirse a este género.

INTRODUCTION

Recent phylogenetic studies (summarized in Soltis et al. 2001) have shown that *Saxifraga*, as currently understood, must be divided into two genera: *Saxifraga* L. sensu stricto and *Micranthes* Haw. *Micranthes* differs from *Saxifraga* in having usually leafless (vs leafy) flowering stems, reticulate (vs striate or granular) pollen exine, carpels usually connate for less than half (vs more than half) their lengths, ovules with a single (vs two) integuments, and longitudinally ribbed (vs. smooth, tuberculate or papillate) seeds (Gornall and Ohba, ined.). In these phylogenies, *Saxifraga tolmiei*, one of two species of section *Merkianae*, falls at the base of the *Micranthes* clade and appears to belong to this genus. Webb and Gornall (1989) provide a list of *Saxifraga* sensu lato species by section for Europe, parts of Asia, and North America, in which section *Merkianae* is segregated from section *Micranthes* on the basis of a lack of crystals in leaves and bitegminate ovules. In Russia, Zhmylev (1996, 1997) recognizes *Micranthes* at the subgeneric level, with two sections, *Merkianae* and *Micranthes*, the latter with 6 subsections. This author thus recognized the link between sections *Merkianae* and *Micranthes* but did not acknowledge the distinctiveness of *Micranthes*. Recently, Banfi et al. (2005) recognize *Micranthes* and made new combinations for the Italian species.

In North America, J.K. Small (in Small and Rydberg 1905, 1918) made combinations for a number of the taxa that belong to *Micranthes*. Not all North American taxa were given names in this genus, however, since Small also recognized other segregate genera such as *Spatularia*, the species of which belong to *Micranthes*, or *Leptasea*, which included some species related to *Micranthes*, notably *Leptasea (Saxifraga) tolmiei*. Furthermore, a few species have been described since (Elvander & Denton 1976; Elvander 1984; Skelly 1988). The treatment of *Saxifraga* for the Flora of North America project prepared by the late Patrick E. Elvander (unpublished manuscript) did not segregate *Micranthes*, but provided a list of recognized North American taxa, except for the taxa recently described by Zhmylev (1990, 1992, 1993), which were not dealt with. All species not listed below belong to *Saxifraga* sensu stricto. The sole exception is *Cascadia nuttallii* (Small) A.M. Johnson (syn. *Saxifraga nuttallii* Small), shown to be sister to the South American genus *Saxifragodes* in phylogenetic analyses, both in turn being the sister group to *Micranthes* (e.g., Soltis et al. 2001). *Cascadia* is distinguished by its trailing, leafy stems that do not arise from persistent basal rosettes, its distinct carpels each independently adnate to the hypanthium, its bitegminate ovules, and its spiny seeds.

Our goal is to provide the necessary combinations for the North American taxa that have not yet been

treated within *Micranthes*. Combinations for Eurasian taxa also present into North America were suggested by Gornall and Ohba (ined.) but have yet to be published. Given the necessity of having these names published, they are reported here as new combinations and are ascribed to these authors (to be cited as “Gornall & H. Ohba in Brouillet & Gornall”). In their work, they accept the division into two genera and provide new combinations for Eurasian taxa. Table 1 provides the list of names for North American taxa available in the literature.

NEW COMBINATIONS

Micranthes bryophora (A. Gray) Brouillet & Gornall, comb. nov. *Saxifraga bryophora* A. Gray, Proc. Amer. Acad. Arts 6:533. 1865. TYPE: U.S.A. CALIFORNIA: Ebbett's Pass, W.H. Brewer 1984 (LECTOTYPE: GH; ISOLECTOTYPE: US!).

Saxifraga bryophora A. Gray var. *tobiasae* J.W. Grimes & P.L. Packard; *Spatularia bryophora* (A. Gray) Small

Micranthes calycina (Sternb.) Gornall & H. Ohba, comb. nov. *Saxifraga calycina* Sternb., Rev. Saxifr. Suppl. 2:10. 1831.

Micranthes ferruginea (Graham) Brouillet & Gornall, comb. nov. *Saxifraga ferruginea* Graham, Edinb. N. Phil. J. 7:349. 1829. TYPE: plants grown at Edinburgh from seed sent by Richardson in 1827 and flowered in 1829 (HOLOTYPE: E).

Hexaphoma ferruginea Raf.

Saxifraga ferruginea Graham var. *macounii* Engl. & Irmsch.

Saxifraga newcombei (Small) Engl. & Irmsch.

Spatularia newcombei Small

Spatularia ferruginea (Graham) Small

Micranthes foliolosa (R. Br.) Gornall, comb. nov. *Saxifraga foliolosa* R. Br., Chlor. Melvill. 17. 1823. TYPE: Parry's first voyage, 1819–20, Cap. Nels., Melville Island, Mr James Ross (HOLOTYPE: BM).

Micranthes gormanii (Suksd.) Brouillet & Gornall, comb. nov. *Saxifraga gormanii* Suksd., Torreya 23:106. 1923. TYPE: U.S.A. OREGON. Multnomah Co.: Elk Rock, Gorman 4081 (HOLOTYPE: WS!).

Saxifraga occidentalis var. *dentata* (Engl. & Irmsch.) C.L. Hitchc.

Micranthes idahoensis (Piper) Brouillet & Gornall, comb. nov. *Saxifraga idahoensis* Piper, Bull. Torrey Bot. Club 27:394. 1900. TYPE: U.S.A. IDAHO. Latah Co.: Kendrick, Henderson 4588 (HOLOTYPE: GH; ISOTYPE: NY)

Saxifraga marshallii Greene ssp. *idahoensis* (Piper) D.L. Krause & Beamish

Saxifraga marshallii var. *idahoensis* (Piper) Engl. & Irmsch.

Saxifraga occidentalis S. Watson var. *idahoensis* (Piper) C.L. Hitchc.

Micranthes mexicana (Engl. & Irmsch.) Brouillet & Gornall, comb. nov. *Saxifraga mexicana* Engl. & Irmsch., Pflanzenr. 67 (IV. 117):42. 1916. TYPE: MEXICO. CHIHUAHUA: near Colonia Garcia, alt. 7500 ft, Townsend & Barber 88 (LECTOTYPE designated by Webb & Gornall 1989: K).

Micranthes nelsoniana (D. Don) Small var. ***aestivalis*** (Fisch. & C.A. Mey.) Gornall & H. Ohba, comb. et stat. nov. *Saxifraga aestivalis* Fisch. & C.A. Mey., Ind. Sem. Hort. Bot. Peteropl. 1:37. 1835. TYPE: RUSSIA. SIBERIA: Altai, 1817, Herb. Fischer s.n. (LECTOTYPE: LE).

Micranthes nelsoniana (D. Don) Small var. ***carlottae*** (Calder & Savile) Gornall & H. Ohba, comb. et stat. nov. *Saxifraga punctata* Willd. subsp. *carlottae* Calder & Savile, Canad. J. Bot. 38:423. 1960. TYPE: CANADA. BRITISH COLUMBIA: Queen Charlotte Islands, Moresby Island, Calder, Savile and Taylor 23093 (HOLOTYPE: DAO).

Micranthes nelsoniana (D. Don) Small var. ***cascadensis*** (Calder & Savile) Gornall & H. Ohba, comb. et stat. nov. *Saxifraga punctata* Willd. subsp. *cascadensis* Calder & Savile, Canad. J. Bot. 38:425. 1960. TYPE: U.S.A. WASHINGTON. Yakima Co.: Mt. Paddo (Mt. Adams), Suksdorf 2504 (HOLOTYPE: NY).

Micranthes nelsoniana (D. Don) Small var. ***insularis*** (Hultén) Gornall & H. Ohba, comb. et stat. nov. *Saxifraga punctata* Willd. subsp. *insularis* Hultén in Sven. Bot. Tidskr. 30:524. 1936. TYPE: U.S.A. ALEUTIAN ISLANDS: Carlisle Island, E. Hultén 6591 (HOLOTYPE: S).

Micranthes nelsoniana (D. Don) Small var. ***pacifica*** (Hultén) Gornall & H. Ohba, comb. et stat. nov. *Saxifraga punctata* Willd. subsp. *pacifica* Hultén, Fl. Alaska & Yukon 5:928. 1945. TYPE: U.S.A. ALASKA: Juneau, H. Anderson 47 (SYNTYPE: H).

TABLE 1. List of *Micranthes* names already published for North America.

<i>Micranthes aequidentata</i> Small = <i>rufidula</i>	<i>Micranthes lata</i> Small = <i>occidentalis</i>
<i>Micranthes aestivalis</i> (F. & M.) Small = <i>nelsoniana</i> var. <i>aestivalis</i>	<i>Micranthes lyallii</i> (Engler) Small
<i>Micranthes allenii</i> Small = <i>occidentalis</i>	<i>Micranthes marshallii</i> (Greene) Small
<i>Micranthes apetala</i> (Piper) Small	<i>Micranthes micranthidifolia</i> (Haw.) Small
<i>Micranthes aprica</i> (Greene) Small	<i>Micranthes montana</i> Small = <i>nidifica</i>
<i>Micranthes arguta</i> (D. Don) Small = <i>odontoloma</i>	<i>Micranthes montanensis</i> (Small) Small = <i>oregana</i>
<i>Micranthes arnoglossa</i> Small = <i>oregana</i>	<i>Micranthes napensis</i> (Small) Small = <i>californica</i>
<i>Micranthes bidens</i> Small = <i>integrifolia</i>	<i>Micranthes nelsoniana</i> (D. Don) Small
<i>Micranthes brachypus</i> Small = <i>oregana</i>	<i>Micranthes nidifica</i> (Greene) Small
<i>Micranthes californica</i> (Greene) Small	<i>Micranthes nivalis</i> (L.) Small
<i>Micranthes careyana</i> (A. Gray) Small	<i>Micranthes occidentalis</i> (S. Watson) Small
<i>Micranthes caroliniana</i> (A. Gray) Small	<i>Micranthes odontoloma</i> (Piper) A. A. Heller
<i>Micranthes claytoniifolia</i> (Canby) Small = <i>fragosa</i>	<i>Micranthes oregana</i> (Howell) Small
<i>Micranthes columbiana</i> (Piper) Small = <i>nidifica</i>	<i>Micranthes palmeri</i> Bush
<i>Micranthes crenatifolia</i> Small = <i>rhomboidea</i>	<i>Micranthes parvifolia</i> (Greene) Small = <i>californica</i>
<i>Micranthes davurica</i> (Willd.) Small is misapplied in North America	<i>Micranthes pennsylvanica</i> (L.) Haw.
<i>Micranthes eriophora</i> (S. Watson) Small	<i>Micranthes plantaginea</i> (Small) Small = <i>nidifica</i>
<i>Micranthes fallax</i> (Greene) Small = <i>californica</i>	<i>Micranthes pilosa</i> (Haw.) Bush = <i>virginiensis</i>
<i>Micranthes flabellifolia</i> (R. Br.) Small = <i>unaliaschensis</i> , misapplied in North America	<i>Micranthes reflexa</i> (Hooker) Small
<i>Micranthes fragosa</i> (Suksd.) Small	<i>Micranthes rhomboidea</i> (Greene) Small
<i>Micranthes franciscana</i> Small = <i>rhomboidea</i>	<i>Micranthes rufidula</i> Small
<i>Micranthes galacifolia</i> Small = <i>spicata</i>	<i>Micranthes rydbergii</i> (Small) Small = <i>subapetala</i>
<i>Micranthes gaspensis</i> (Fernald) Small	<i>Micranthes saximontana</i> (E. Nelson) Small = <i>occidentalis</i>
<i>Micranthes geum</i> (L.) Small: not in North America	<i>Micranthes sierrae</i> (Coville) A. Heller = <i>oregana</i>
<i>Micranthes greenei</i> Blankinship = <i>rhomboidea</i>	<i>Micranthes spicata</i> (D. Don) Small
<i>Micranthes hieraciifolia</i> (Waldst. & Kit.) Haw.	<i>Micranthes stellaris</i> (L.) Galasso, Banfi & Soldano
<i>Micranthes howellii</i> (Greene) Small	<i>Micranthes subapetala</i> (E. Nelson) Small
<i>Micranthes integrifolia</i> (Hooker) Small	<i>Micranthes tenuis</i> (Wahl.) Small
<i>Micranthes interrupta</i> Small = <i>rhomboidea</i>	<i>Micranthes tennesseensis</i> (Small) Small = <i>careyana</i>
<i>Micranthes kumlienii</i> Small = <i>nivalis</i>	<i>Micranthes texana</i> (Buckl.) Small
	<i>Micranthes virginiensis</i> (Michx.) Small
	<i>Saxifraga virginiensis</i> Michx. var. <i>subintegra</i> Goodman
	<i>Micranthes yukonensis</i> Small = <i>reflexa</i>

Micranthes nudicaulis (D. Don) Gornall & H. Ohba, comb. nov. *Saxifraga nudicaulis* D. Don, Trans. Linn. Soc. 13:366.

1822. TYPE: [Alaska]: "ad oras occidentales Americae borealis" Northwest coast of America [Alaska], Sledge Island, D. Nelson (HOLOTYPE: BM).

Micranthes petiolaris (Raf.) Brouillet & Gornall, comb. nov. *Hexaphoma petiolaris* Raf., Fl. Tell. 2:67. 1836. TYPE: not found.

- Saxifraga michauxii* Britton
- Saxifraga leucanthemifolia* Michx. 1804, not Lapeyrouse 1803
- Spatularia leucanthemifolia* Haw.
- Spatularia petiolaris* (Raf.) Small
- Spatularia michauxii* (Britton) Small

Micranthes razshivinii (P. Yu. Zhmylev) Brouillet & Gornall, comb. nov. *Saxifraga razshivinii* Zhmylev, Byull. Mosk. Obshch. Ispyt. Prir., Biol. 95(3):87. 1990. TYPE: CANADA. YUKON: Mt. Sedgwick area, British Mts., J.A. Calder 34478 (HOLOTYPE: DAO).

Saxifraga davurica Willd. subsp. *grandipetala* (Engl. & Irmsch.) Hultén

Micranthes tempestiva (Elvander & Denton) Brouillet & Gornall, comb. nov. *Saxifraga tempestiva* Elvander & Denton, Madroño 23:346. 1976. TYPE: U.S.A. MONTANA. Deerlodge Co.: Anaconda Range, Goat Flat, Elvander 492 (HOLOTYPE: WTU!; ISOTYPES: NY!, UC!).

Micranthes tischii (Skelly) Brouillet & Gornall, comb. nov. *Saxifraga tischii* Skelly, Madroño 35:126–131. 1988. TYPE: U.S.A. WASHINGTON. Clallam Co.: Olympic Mountains, Mt. Baldy, Tisch 2307 (HOLOTYPE: UC!).

Micranthes tolmiei (Torrey & A. Gray) Brouillet & Gornall, comb. nov. *Saxifraga tolmiei* Torrey & A. Gray, Fl. N. Amer. 1:582. 1840. TYPE: U.S.A.: Northwest coast, 1838, *Tolmie s.n.* (LECTOTYPE: GH).

Micranthes unalaschensis (Sternb.) Gornall & H. Ohba, comb. nov. *Saxifraga unalaschensis* Sternb., Rev. Saxifrag., suppl. 2:9. 1831. TYPE: In insula Unalaschka, *Chamisso* (HOLOTYPE: LE).

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